## WHAT IS CLAIMED IS:

1	<ol> <li>A method to create and acoustically manipulate a microbubble</li> </ol>				
2	within a volume of material, the method comprising:				
3	propagating at least one laser pulse through the material to create a				
4	microbubble within the material; and				
5	propagating at least one acoustic wave through the material to a				
6	surface of the microbubble to controllably manipulate the microbubble within the				
7	material without destroying the microbubble.				
1	2. The method as claimed in claim 1, wherein the at least one				
2	laser pulse is an ultrafast laser pulse and wherein the microbubble is created via				
3	laser induced optical breakdown (LIOB) with little or no change to material				
4	immediately adjacent to the microbubble.				
1	3. The method as claimed in claim 1, wherein the volume of				
2	material includes a liquid or semi-liquid material.				
1	4. The method as claimed in claim 1, wherein the at least one				
2	acoustic wave includes an ultrasound wave.				
1	5. The method as claimed in claim 4, wherein the ultrasound				
2	wave exerts a substantially continuous force at the surface of the microbubble.				
1	6. The method as claimed in claim 4, wherein the ultrasound				
2	wave exerts a pulsed force at the surface of the microbubble.				
1	7. The method as claimed in claim 1, wherein the at least one				
2	acoustic wave exerts a force in the nano-Newton to micro-Newton level at the				
3	surface of the microbubble.				

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material is a cell culture or intact tissue.

1	8. The method as claimed in claim 1, wherein the at least one				
2	acoustic wave exerts a force in the pico-Newton to femto-Newton level at the				
3	surface of the microbubble.				
1	9. The method as claimed in claim 1, wherein the step of				
2	propagating the at least one acoustic wave causes the microbubble to exert a				
3	mechanical force on at least one structure in contact with the microbubble.				
1	10. The method as claimed in claim 9, wherein the at least one				
2	structure is a biological structure.				
	<u> </u>				
1	11. The method as claimed in claim 1, wherein the step of				
2	propagating the at least one acoustic wave causes the microbubble to move within				
3	the volume of material.				
1	12. The method as claimed in claim 11 further comprising				
2	measuring elasticity of material in contact with the microbubble based on movement				
3	of the microbubble.				
1	13. The method as claimed in claim 11, wherein the step of				
2	propagating the at least one acoustic wave causes the microbubble to mix the				
3	material.				
l	14. The method as claimed in claim 1, wherein the microbubble				
2	is a nanobubble.				
1	15. The method as claimed in claim 1, wherein the step of				
2	propagating the at least one acoustic wave causes the microbubble to manipulate at				
3	least one structure in contact with the microbubble.				
1	16. The method as claimed in claim 1, wherein the volume of				

1	17. The method as claimed in claim 1, wherein the volume of					
2	material is an extracellular medium of a diffuse cell culture and wherein the step					
3	propagating the at least one acoustic wave causes the microbubble to manipulate at					
4	least one cell for patterning.					
1	18. The method as claimed in claim 1, wherein the at least one					
2	laser pulse is a femtosecond laser pulse.					
1	19. The method as claimed in claim 1, wherein the microbubble					
2	has an optical refractive index different from an optical refractive index of the					
3	material and wherein the method further comprises propagating a beam of light					
4	through the microbubble.					
1	20. The method as claimed in claim 2, wherein the step of					
2	propagating the at least one laser pulse also creates at least one acoustic shock wave					
3	via LIOB wherein the at least one acoustic shock wave operates as a high frequency,					
4	high precision acoustic source.					
1	21. A system to create and acoustically manipulate a microbubble					
2	within a volume of material, the system comprising:					
3	a pulsed laser for generating at least one laser pulse;					
4	an optical subsystem for directing the at least one laser pulse to the					
5	material wherein the at least one laser pulse propagates through the material to					
6	create a microbubble within the volume of material; and					
7	an acoustic source for directing acoustic energy to the material					
8	wherein at least one acoustic wave propagates through the material to a surface of					
9	the microbubble to controllably manipulate the microbubble within the volume o					
10	material without destroying the microbubble.					
1	22. The system as claimed in claim 21, wherein the microbubble					
2	is created via laser induced optical breakdown (LIOB) with little or no damage to					
3	material immediately adjacent to the microbubble.					

1	23. The system as claimed in claim 21, wherein the source is an				
2	ultrasound source and wherein an ultrasound wave is propagated in a direction				
3	through the material and wherein the microbubble moves in the direction of the				
4	ultrasound wave.				
1	24. The system as claimed in claim 21, further comprising a				
2	modulated acoustic source for directing modulated acoustic energy to the material				
3	wherein at least one modulated acoustic wave propagates through the material to the				
4	microbubble to cause the microbubble to mix material in a neighborhood of the				
5	microbubble.				
1	25. The system as claimed in claim 21, wherein the at least one				
2	laser pulse is an ultrafast laser pulse.				
1	26. The system as claimed in claim 21, wherein the volume of				
2	material includes a liquid or semi-liquid material.				
1	27. The system as claimed in claim 21, wherein the at least one				
2	acoustic wave includes an ultrasound wave.				
1	28. The system as claimed in claim 27, wherein the ultrasound				
2	wave exerts a substantially continuous force at the surface of the microbubble.				
1	29. The system as claimed in claim 27, wherein the ultrasound				
2	wave exerts a pulsed force at the surface of the microbubble.				
1	30. The system as claimed in claim 21, wherein the at least one				
2	acoustic wave exerts a force in the nano-Newton to micro-Newton level at the				
3	surface of the microbubble.				
1	31. The system as claimed in claim 21, wherein the at least one				
2	acoustic wave exerts a force in the pico-Newton to femto-Newton level at the				
3	surface of the microbubble.				

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2			the microbubble to exert a mechanical force on at least one ith the microbubble.
1 2	structure is a big		The system as claimed in claim 32, wherein the at least one al structure.
1	3	34.	The system as claimed in claim 21, wherein the at least one
2	acoustic wave c	auses	the microbubble to move within the volume of material.
1			The system as claimed in claim 34, wherein the at least one
2	acoustic wave c	auses	the microbubble to mix the material.
1	3	86.	The system as claimed in claim 21, wherein the microbubble
2	is a nanobubble	•	
1	3	37.	The system as claimed in claim 21, wherein the at least one
2			he microbubble to manipulate at least one structure in contact
3	with the microb	ubble.	
1	3	38.	The system as claimed in claim 21, wherein the volume of
2	material is a cel	ll cultu	re or intact tissue.
1	3	39.	The system as claimed in claim 21, wherein the volume of
2	material is an ex	ctracell	ular medium of a diffuse cell culture and wherein the at least
3	one acoustic w	ave ca	auses the microbubble to manipulate at least one cell for
4	patterning.		
1	4	Ю.	The system as claimed in claim 21, wherein the at least one
2	laser pulse is a	femtos	econd laser pulse.

The system as claimed in claim 21, wherein the at least one

1	41. The system as claimed in claim 21, wherein the microbubble		
2	has an optical refractive index different from an optical refractive index of the		
3	material and wherein the system further comprises means for propagating a beam		
4	of light through the microbubble.		
1	42. The system as claimed in claim 22, wherein the at least one		
2	laser pulse also creates at least one acoustic shock wave via LIOB wherein the at		
3	least one acoustic shock wave operates as a high frequency, high precision acoustic		
1	source.		
1	43. The system as claimed in claim 34 further comprising means		
2	for measuring elasticity of material in contact with the microbubble based on		
3	movement of the microbubble.		